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EXAMINER	
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3746	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/526,444	STEIN ET AL.	
	Examiner	Art Unit	
	DNYANESH KASTURE	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 August 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-67* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *18 Aug 10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because it uses the legal phraseology "means (20) for" in Line 3 and refers to it again in Line 4 and Line 6. Correction is required. See MPEP § 608.01(b): "The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided".

Claim Objections

2. The previously made objections to Claims 1, 7, 27, 38, 46, 47, 59, 67 are hereby withdrawn because the applicant made the examiner's proposed amendments to the claims.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, 5, 6, 8, 12, 13, 18, 26, 31, 32, 45, 48, 52, 53, 66 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. In Re Claims 2, 5, 6, 8, 12, 13, 26, 31,32, 45, 48, 52, 53 and 66, the word "small" in the phrase "small fraction" is indefinite (see response to arguments section). The

term "small" in the above claims is a relative term which renders the claim indefinite. The term "small" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

6. In Re Claim 18, the range: "below full output but above a fixed or variable threshold" and "falls below a fixed or variable threshold" is indefinite (see response to arguments section). If the threshold is variable, how do you know that you have fallen below it ? (see response to arguments section for an example) The term "variable threshold" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

7. In Re Claims 5 and 6, "partial pumping mode" and "partial motoring mode" is inconsistent with Claim 1 because Claim 1 already states that the machine is operable in a partial mode. In Claim 5, instead of stating that "the machine is operable in a partial pumping mode", it is suggested to state that – wherein the partial mode is a partial pumping mode --. In Claim 6, instead of stating that "the machine is operable in a partial motoring mode", it is suggested to state that – wherein the partial mode is a partial motoring mode --. If this is not acceptable, then for the dependent claims 5 and 6 that lack antecedent basis for partial pumping mode and partial motoring mode, it is assumed that the limitations of Claim 3 are incorporated into independent Claim 1 (see response to arguments section).

8. Applicant has not corrected the following inconsistency mentioned in the previous office action: Claim 6 is with reference to the partial motoring mode which opens the valve "fraction after the top dead center", whereas Claim 45 refers to the partial motoring mode which opens the valve "fraction in advance of the top dead center" which really relates to the partial pumping mode. (Appropriate corrections were made to Claims 12, 26 and 31 which had the same issue).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturman (US Patent 6,183,207 B1) in view of Nippert (US Patent 6,651,545 B2) and as extrinsically evidenced by Salter et al (US Patent 5,259,738 A indirectly referenced in applicant's disclosure of prior art)

11. In Re Claim 1, Sturman discloses a fluid-working machine (title: "digital pump") having a plurality of working chambers (in 14, 16, 18, 20) of cyclically changing volume,

a high-pressure fluid manifold (38) and a low-pressure fluid manifold (36) - they are manifolds because Column 2, Lines 35-37 state: "the pump may have a single inlet port and a single outlet port that are arranged in fluid communication with the pump chambers by passages in the pump housing 12", at least one valve (40, 44, 46) on the inlet side linking each working chamber to each manifold, and an electronic sequencing controller (48) for operating (intended use language) said valves in timed relationship with the changing volume of each chamber, wherein the electronic sequencing controller has a configuration to operate the valves of each chamber in one of an idling mode ("by-pass state" - Column 3, Line 15 and Line 22) and a full mode (Column 3, Line 23: "only the first pump assembly 14 is pumping fluid out") in which all of the usable volume of the chamber is used

- and the electronic sequencing controller has a configuration to select the mode (Sturman discloses at least three different combinations of chambers in full/idle mode – Column 3, Lines 20-29) of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine as suggested in Column 3, Lines 14-15: "In this manner, the controller 48 can define a number of different modes" and Column 3, Lines 29-30: "The various modes may each provide a different output flowrate for the pump"; with regards to the limitation "on successive cycles of working chamber volume" Sturman states that the selection is made during operation ("without changing the speed of the shaft" – Column 3, Line 33) where cycles of changing volume are occurring continuously and consecutively, and it would be obvious to one of ordinary skill not to interrupt a cycle for a chamber in a FULL

mode until it has completely displaced its volume (cycle complete) because otherwise there could exist a flowrate that was never intended. Salter et al provides further evidence thereof in Column 6, Lines 49-55: "It will, for example, be possible to programme the operation of a pump so that its output varies from cycle to cycle. Alternatively, a pump can be divided into a number of independently operable sections each comprising a plurality of cylinders. Each section can be independently controlled as to displacement .."

12. However, Sturman does not disclose a partial mode in which only part of the usable volume of the chamber is used.

13. Nevertheless, Nippert discloses in Column 8, Lines 43-47: "The displacement of the fluid pump 12 can also be varied by controlling the volume that EACH piston 46 can produce. This is accomplished by permitting the selected one or ones of the pistons 46 to effectively PUMP A PORTION of their total volume and BYPASS THE REMAINING portion". Nippert also discloses an actuator (76 or 78) that is fast enough and strong enough to move the check valves (72) in order to enable the partial pumping mode.

14. It would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the operation of any of the pump sub assemblies (14, 16, 18, 20) of Sturman so that the working chambers (24) only pump a portion of their total volume and bypass the remaining portion (by switching valve 46 part way through the exhaust stroke so that member 44 is exposed to the high pressure port and opens the inlet check valve 40), and (if necessary) to substitute the actuator (46) of Sturman with the actuator (76 or 78) of Nippert for the purpose of providing more variety of

displacements to choose from because an additional partial pumping mode is now available.

15. Note that one of ordinary skill would not be motivated to always operate the modified device in a partial mode (ignoring full and idle) because it would destroy the "digital" operation (title) of the device (See response to arguments section).

16. In Re Claim 2, determining the precise fraction of usable volume in the partial mode would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

17. Claims 25, 26, 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nippert (US Patent 6,651,545 B2) in view of Salter et al (US Patent 5,259,738 A indirectly referenced in applicant's disclosure of prior art) and as extrinsically evidenced by Mestieri (US Patent 4,945,816 A)

18. In Re Claims 25 and 44, Nippert discloses a fluid-working machine (title: "fluid translating device) comprising a plurality of working chambers (48) of cyclically changing volume, said working chambers comprising cylinders (44) within which pistons (46) are arranged to reciprocate, a high-pressure fluid manifold (54); a low-pressure

fluid manifold (52); at least one valve (64, 66) linking each working chamber to each manifold ("B", "D", "F" and "A", "C", "E" in Figure 4),

- a controller (24) having a configuration to operate the valves of at least one of said working chambers in a partial motoring mode in which only part of the usable volume of the at least one working chamber is used as implied by the following two statements: Column 7, Lines 34-36: "the operation thereof is described with it being used as a fluid pump 12. However, it is recognized that it is also applicable as a fluid motor" and Column 8, Lines 43-47: "The displacement of the fluid pump 12 can also be varied by controlling the volume that each piston 46 can produce. This is accomplished by permitting the selected one or ones of the pistons 46 to effectively pump a portion of their total volume and bypass the remaining portion". From these two statements, it should be clear to one of ordinary skill that pumping a portion of the total volume and bypassing the rest when the device is operated as a pump is analogous to motoring the piston using a portion of the total volume and bypassing the rest when the device is operated as a fluid motor. Mestieri provides additional evidence that a partial motoring mode for a fluid motor can be created simply by manipulation of the controlling valves as suggested in Column 5, Lines 1-5: "Additionally a "variable displacement" mode can be effected by appropriate control of valves 30 by controller 52 in response to the information in the in-board computer 64 received from disc 20, to meet REDUCED TORQUE requirements"

19. In any case, Salter et al discloses a partial motoring mode in Column 4, Lines 30-31 ("partially disabled motor") and in Lines 63-68: "..close the high-pressure valve 30

part way through the power stroke. The low-pressure valve 40 will then be opened by the pressure differential for the remaining stroke until the piston 12 reaches bottom-dead-centre. The controller 20, if it continues to play its motor role, will leave the low-pressure valve open for the discharge stroke". The Nippert apparatus can therefore be operated in accordance with this Salter et al teaching in the following manner: At the start of the power stroke, the piston is in the TDC position, the low pressure valve 64 is closed and high pressure valve 66 is opened. As a result, high pressure fluid enters the chamber and the piston is motored (starts moving) towards to BDC position. Part way through the power stroke, the high pressure valve 66 is closed and the low pressure valve 64 is opened for the remainder of the stroke until the piston reaches BDC. The controller (24), if it continues to play its motor role, will leave the low-pressure valve 66 open for the discharge stroke. This operation is clearly the partial motoring mode and not the full motoring mode.

20. It would have been obvious to a person having ordinary skill in the art at the time of the invention to program the controller of Nippert to operate the high and low pressure valves in the partial motoring mode as suggested by Salter et al in a manner described above for the purpose of providing added versatility to the device by having both partial pumping and partial motoring modes. If the modification leads to anticipated success, it is likely the product of ordinary skill and common sense and not the product of innovation.

21.

22. In Re Claim 26 and 45 (as best understood), Nippert teaches a machine wherein partial motoring mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low- pressure manifold a small fraction after the top dead centre position of the piston (Partial motoring mode operates in a manner similar to partial pumping mode. Therefore it would be possible to use a first portion of the volume to create rotary motion, bypass an intermediate portion, and use the remaining portion of the volume to create motion. Thus, after the bypassed portion, the low pressure valve would need to open to allow the fluid to be pumped, while the high pressure valve would need to close to prevent the bypass effect.). ALTERNATIVELY, determining precisely when to actuate the valves during the stroke (fraction after the TDC) would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

23. Alternatively Claim 1 and Claims 3 - 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturman (US Patent 6,183,207 B1) in view of Salter et al (US Patent 5,259,738 A indirectly referenced in applicant's disclosure of prior art) and further in view of Nippert (US Patent 6,651,545 B2)

24. In Re Claims 1 and 3, Sturman discloses a fluid-working machine (title: "digital pump") having a plurality of working chambers (in 14, 16, 18, 20) of cyclically changing

volume, a high-pressure fluid manifold (38) and a low-pressure fluid manifold (36) - they are manifolds because Column 2, Lines 35-37 state: "the pump may have a single inlet port and a single outlet port that are arranged in fluid communication with the pump chambers by passages in the pump housing 12", at least one valve (40, 44, 46) on the inlet side linking each working chamber to each manifold, and an electronic sequencing controller (48) for operating (intended use language) said valves in timed relationship with the changing volume of each chamber, wherein the electronic sequencing controller has a configuration to operate the valves of each chamber in one of an idling mode ("by-pass state" - Column 3, Line 15 and Line 22) and a full mode (Column 3, Line 23: "only the first pump assembly 14 is pumping fluid out") in which all of the usable volume of the chamber is used

- and the electronic sequencing controller has a configuration to select the mode (Sturman discloses at least three different combinations of chambers in full/idle mode – Column 3, Lines 20-29) of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine as suggested in Column 3, Lines 14-15: "In this manner, the controller 48 can define a number of different modes" and Column 3, Lines 29-30: "The various modes may each provide a different output flowrate for the pump"; with regards to the limitation "on successive cycles of working chamber volume" Sturman states that the selection is made during operation ("without changing the speed of the shaft" – Column 3, Line 33) where cycles of changing volume are occurring continuously and consecutively, and it would be obvious to one of ordinary skill not to interrupt a cycle for a chamber in a FULL

mode until it has completely displaced its volume (cycle complete) because otherwise there could exist a flowrate that was never intended. Salter et al provides further evidence thereof in Column 6, Lines 49-55: "It will, for example, be possible to programme the operation of a pump so that its output varies from cycle to cycle. Alternatively, a pump can be divided into a number of independently operable sections each comprising a plurality of cylinders. Each section can be independently controlled as to displacement .."

25. Sturman however, does not disclose full and partial motoring modes and a partial pumping mode.

26. Nevertheless, Salter et al discloses a fluid working machine that is capable of motoring or pumping simply by revising the valve actuation cycle as suggested in Column 4, Lines 7-8: "it could transform the motor into a pump by revising the valve actuation cycle". Further, Salter et al also discloses a partial motoring mode in Column 4, Lines 30-31 ("partially disabled motor") and in Lines 63-68: "..close the high-pressure valve 30 part way through the power stroke. The low-pressure valve 40 will then be opened by the pressure differential for the remaining stroke until the piston 12 reaches bottom-dead-centre. The controller 20, if it continues to play its motor role, will leave the low-pressure valve open for the discharge stroke".

27. It would have been obvious to a person having ordinary skill in the art at the time of the invention to substitute the inlet valves (40, 44, 46) and outlet valves (42) of every pump subassembly of Sturman with the electromagnetic valves (13, 15) of Salter et al for the purpose of making the device of Sturman more versatile by functioning as a fluid

motor or a pump. The added motoring and partial motoring features in the modified apparatus provides more variety of displacements to choose from to meet Sturman's objective of providing the desired flow rate (Column 3, Lines 29-30: "The various modes may each provide a different output flow rate"). Note that the enabling and disabling of cylinders (through the bypass state in the pump configuration of Sturman) would still be available when the motoring mode is added as suggested in Column 4, Lines 22-25: "A motor according to this invention would allow cylinder disabling in much the same way as is described in the aforesaid European patent application for a pump"

28. Sturman modified by Salter et al as discussed above discloses all the claimed limitations except for explicitly stating the partial pumping mode. Note that a partial motoring mode implies the presence of a partial pumping mode because pumps operate reverse of motors, and can be transformed from one to the other.

29. Nevertheless, Nippert discloses in Column 8, Lines 43-47: "The displacement of the fluid pump 12 can also be varied by controlling the volume that EACH piston 46 can produce. This is accomplished by permitting the selected one or ones of the pistons 46 to effectively PUMP A PORTION of their total volume and BYPASS THE REMAINING portion".

30. It would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the operation of any of the pump sub assemblies (14, 16, 18, 20) of Sturman so that the working chambers (24) only pump a portion of their total volume and bypass the remaining portion for the purpose of providing more variety of

displacements to choose from because an additional partial pumping mode is now available.

31. In Re Claim 4, Sturman discloses chambers (24) and Nippert discloses piston bores (44) and Salter et al discloses cylinders (11) in which the pistons are arranged to reciprocate.

32. In Re Claim 5, Nippert teaches a machine according to claim 4 (see the rejection of claim 4 above), wherein partial pumping mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead centre position of the piston (Nippert discloses that in partial pumping mode it is possible to pump a first portion of the volume, bypass an intermediate portion, and pump the remaining portion. That is, after the bypassed portion, the high pressure valve would need to open to allow the fluid to be pumped, while the low pressure valve would need to close to prevent the bypass effect.). ALTERNATIVELY, determining precisely when to actuate the valves during the stroke (fraction in advance of TDC) would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

33. In Re Claim 6, Nippert teaches a machine according to claim 4 (see the rejection of claim 4 above), wherein partial motoring mode includes closing the valve linking the

cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low- pressure manifold a small fraction after the top dead centre position of the piston (Partial motoring mode operates in a manner similar to partial pumping mode. Therefore it would be possible to use a first portion of the volume to create rotary motion, bypass an intermediate portion, and use the remaining portion of the volume to create motion. Thus, after the bypassed portion, the low pressure valve would need to open to allow the fluid to be pumped, while the high pressure valve would need to close to prevent the bypass effect.). ALTERNATIVELY, determining precisely when to actuate the valves during the stroke (fraction after the TDC) would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

34. In Re Claim 7, Sturman, Nippert and Salter et al as applied to Claim 3 discloses all the claimed limitations because MPEP 2112.02 states that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device.

35. In Re Claim 8, determining the precise fraction of usable volume in the partial mode would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B). Sturman, Nippert and Salter et al as

applied to Claim 3 discloses all the claimed limitations because MPEP 2112.02 states that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device.

36. In Re Claim 9, Salter et al teaches solenoid actuated valves that control the flow of fluid to each pumping chamber. These valves are actuated by a controller (20) that contains "several built-in algorithms which enable the unit to compare the pump system demand characteristics with system feedback (see column 5 lines 36-55). The controller's decision to operate each valve occurs every cycle of the pump's operation (see column 6 lines 41-48). Therefore it would have been clear to one having ordinary skill in the art that the number of chambers to be operated is chosen by an algorithm.

37. In Re Claim 10, Nippert and Salter et al. teaches a method according to claim 9 (see the rejection of claim 9 above), including a preliminary step of selecting whether to operate the machine as a pump or a motor, and choosing the algorithm accordingly (Since the apparatus cannot be operated as both a pump and a motor at the same time, a decision would need to be made to determine which mode the apparatus would operate in. A pumping algorithm would be necessary when the apparatus is operated in pump mode, and a motoring algorithm would be necessary when the apparatus is operated in motor mode.).

38. In Re Claim 11, Sturman, Nippert and Salter et al as applied to Claim 3 discloses all the claimed limitations because MPEP 2112.02 states that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device.

39. In Re Claim 12, Sturman, Nippert and Salter et al as applied to Claims 3, 4, 6 and 11 discloses all the claimed limitations.

40. In Re Claim 13, Sturman, Nippert and Salter et al as applied to Claims 3, 4, 5 and 11 discloses all the claimed limitations.

41. In Re Claim 14, Sturman, Nippert and Salter et al as applied to Claims 3 and 7 discloses all the claimed limitations.

42. In Re Claim 15, Salter et al as applied to Claim 9 discloses determining system demand and controlling the valves of each piston and cylinder accordingly (by enabling/disabling or partial modes). Determining the precise fraction of partial stroke modes to idle modes would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

43. In Re Claim 16, it would be clear to one of ordinary skill that more flow requires more partial strokes for the same amount of idling strokes thereby increasing the fraction. Also, the manner of operating a device does not distinguish it over prior art.

44. In Re Claim 17, it would be clear to one of ordinary skill that if the flow demand is extremely high, full modes may be necessary and that idle and part modes only may not be sufficient. Once again, determining the precise amounts of full modes, partial modes and idle modes would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

45. In Re Claim 18, as best understood, determining the precise amounts of full modes, partial modes and idle modes without undue experimentation would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

46. In Re Claim 19, Salter et al discloses in Column 3, Lines 28-30: "When the piston 12 is ALMOST at bottom-dead-centre, the controller 20 sends a pulse to close the high-pressure valve 30".

47. In Re Claims 20 and 21, determining the range of fractional volume that provides stability or limits machine noise would have been obvious to a person having ordinary skill in the art since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art – MPEP 2144.05 (II-A).

48. In Re Claim 22, Salter et al distinguishes between a partly disabled motor and a fully enabled one (Column 4, Lines 30-32), and Nippert discloses two different partial pumping modes in Column 8, Lines 47-49, thereby distinguishing it from the full pumping mode.

49. In Re Claim 23, Salter et al discloses that valve actuation occurs near the BDC in the motoring mode (Column 3, Lines 28-30). It would have been obvious to one of ordinary skill to apply the motoring mode teachings to the pumping mode because "the staging of valve timing to ensure a small pressure difference across the valves is very important in practice" (Column 3, Lines 42-44 of Salter et al).

50. In Re Claim 24, Salter et al discloses a "noise algorithm" that reduces shock waves which would motivate one of ordinary skill to select modes accordingly. Salter et al also discloses a pressure control mode (Column 6, Line 10).

51. ALTERNATIVELY in Re Claims 25 and 44, Sturman, Nippert and Salter et al as applied to Claims 14 and 3 respectively discloses all the claimed limitations because these claims are broader.

52. In Re Claims 26 and 45, Sturman, Nippert and Salter et al as applied to Claims 12 and 6 respectively discloses all the claimed limitations.

53. In Re Claim 27, Sturman, Nippert and Salter et al as applied to Claims 14 and 15 discloses all the claimed limitations.

54. In Re Claim 28, Sturman, Nippert and Salter et al as applied to Claims 3 and 9 disclose all the claimed limitations.

55. In Re Claim 29, Salter et al teaches solenoid actuated valves that control the flow of fluid to each pumping chamber. These valves are actuated by a controller (20) that contains "several built-in algorithms which enable the unit to compare the pump system demand characteristics with system feedback (see column 5 lines 36-55). The controller's decision to operate each valve occurs every cycle of the pump's operation (see column 6 lines 41-48). Therefore it would be clear to one having ordinary skill in the art that the number of chambers to be operated is chosen by an algorithm.

56. In Re Claim 30, Sturman, Nippert and Salter et al as applied to Claims 3 and 11 disclose all the claimed limitations.

57. In Re Claim 31, Sturman, Nippert and Salter et al as applied to Claims 30, 4 and 6 disclose all the claimed limitations.

58. In Re Claim 32, Sturman, Nippert and Salter et al as applied to Claims 3, 4 and 5 disclose all the claimed limitations.

59. In Re Claim 33, Sturman, Nippert and Salter et al as applied to Claims 3 and 14 disclose all the claimed limitations.

60. In Re Claim 34, Sturman, Nippert and Salter et al as applied to Claims 3 and 15 disclose all the claimed limitations.

61. In Re Claim 35, Sturman, Nippert and Salter et al as applied to Claims 3 and 16 disclose all the claimed limitations.

62. In Re Claim 36, Sturman, Nippert and Salter et al as applied to Claims 3 and 17 disclose all the claimed limitations.

63. In Re Claim 37, Sturman, Nippert and Salter et al as applied to Claims 3 and 18 disclose all the claimed limitations.

64. In Re Claim 38, Sturman, Nippert and Salter et al as applied to Claims 3 and 19 disclose all the claimed limitations.

65. In Re Claim 39, Sturman, Nippert and Salter et al as applied to Claims 3 and 20 disclose all the claimed limitations.

66. In Re Claim 40, Sturman, Nippert and Salter et al as applied to Claims 3 and 21 disclose all the claimed limitations.

67. In Re Claim 41, Sturman, Nippert and Salter et al as applied to Claims 3 and 22 disclose all the claimed limitations.

68. In Re Claim 42, Sturman, Nippert and Salter et al as applied to Claims 3 and 23 disclose all the claimed limitations.

69. In Re Claim 43, Sturman, Nippert and Salter et al as applied to Claims 3 and 24 disclose all the claimed limitations.

70. In Re Claim 46, Sturman, Nippert and Salter et al as applied to Claims 3 and 27 disclose all the claimed limitations.

71. In Re Claim 47, Salter et al discloses computer controlled poppet valves (Column 1, Line 66) and that the controller is programmed (Column 4, Lines 4-5) to perform the valve actuation cycle. This implies the presence of a computer readable storage medium that stores the computer program related to operation of the controller. Sturman, Nippert and Salter et al as applied to Claim 1 discloses all the claimed limitations. Further, it is assumed that the applicant is claiming a NON-TRANSITORY computer readable storage medium since the specification refers to a microprocessor.

72. In Re Claim 48, determining the precise fraction of usable volume in the partial mode would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

73. In Re Claims 49-67, Sturman, Nippert and Salter et al as applied to Claims 28-46 respectively and as applied to Claim 47 discloses all the claimed limitations.

Response to Arguments

74. Applicant has argued that the word "small" in the phrase "small fraction" is not indefinite because one of ordinary skill would allegedly understand the meaning in light of the specification. Applicant refers to the shaded areas in Figures 2 and 3 to support this position "small fraction in advance of the top dead center position" and "small fraction after the top dead center position".

75. Examiner's response: Claim 2 refers to a small fraction of the usable volume of the chamber in the partial mode, and not a small fraction in advance of/after the top dead center. The specification does not provide any specific numerical values for what the small fraction of the usable volume is. With regards to claims 12, 13, 26, 31, 32, 45, 52, 53 and 66, the beginning and end of shaded areas in Figures 2 and 3 on the time scale to not have corresponding numeric values for time, to enable one of ordinary skill to determine WHEN during the cycle the valves need to be closed/opened in order to meet the limitation "small" fraction.

76. Applicant has argued that the range: "below full output but above a fixed or variable threshold" and "falls below a fixed or variable threshold" is not indefinite because claim 18 clearly discloses two mutually exclusive conditions.

77. Examiner's Response: If the threshold is variable, how do you know that you have fallen below it ? Consider the following example, where the flow demand is determined to be 2 cc/second, and the "variable" threshold is between 1 cc/second and 3 cc/second. Clearly, the flow demand has fallen below the 3 cc/second but it has not

fallen below the 1 cc/second. Therefore it is not clear that the flow demand has fallen below a "variable" threshold. A similar example can be constructed to make "above a fixed or variable" threshold indefinite.

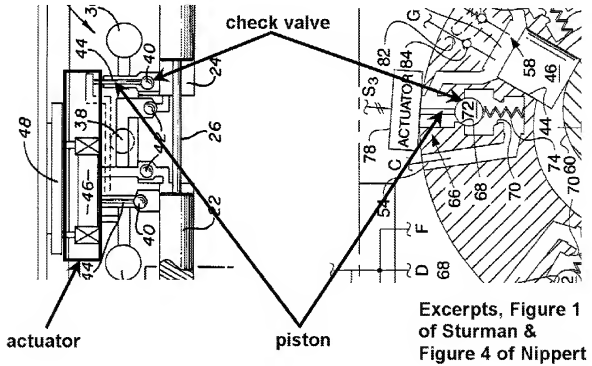
78. Applicant has argued that that the alleged assumption that the limitations of claim 3 are incorporated into independent claim 1 are unjustified. Applicant further argues that machines could be provided which do not have each of the five modes required by claim 3, they may only be pump or motor.

79. Examiner's Response: As mentioned in the 112 rejections, Claims 5 and 6 for instance refer to "partial pumping mode" and "partial motoring mode" without stating that the partial mode of claim 1 is a partial pumping mode (Claim 5) or a partial motoring mode (claim 6).

80. Applicant has argued that Sturman incorporates by reference Patent 5640987 which discloses a valve that is allegedly too slow to operate and would be allegedly inappropriate for partial modes. Applicant further alleges that the piston (44) of Sturman is incapable to open valve (40) against pressure in the chamber.

81. Examiner's Response: MPEP 2145, Section IV states: One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. In re Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Merck & Co., Inc., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Even if the control valve actuator (46) of Sturman is too slow or unable to open valve (40) against

the pressure of the chamber, the actuator (76, 78) of Nippert clearly is capable of these functions (partial pumping mode described on Page 8, Lines 26-35). It is only a matter of routine skill to choose an appropriate actuator to suitably perform the desired valve opening function, and achieving this objective is only a matter of replacing the actuator (46) of Sturman with the actuator (76 or 78) of Nippert. Note that exit pressure is being supplied to the piston (44) of Sturman for the sole purpose of actuating the piston. The figure below shows the equivalent elements of Sturman and Nippert:



82. Applicant has argued that Sturman allegedly does not disclose or suggest selecting the mode of each chamber on successive cycles of changing working chamber volume.

83. Examiner's Response: The only time one of ordinary skill would considering changing the mode of each chamber is between successive cycles of operation otherwise the desired output flow rate will not be achieved because the speed is unchanged (Column 3, Line 32). Column 3, Lines 15-16 state: "the controller 48 can define number of different modes for the pump". The definition relies on the full pumping mode cylinders to remain in full pumping mode until the full volume of the cylinder is pumped (one cycle), so why would one make a change (select a different mode) in the middle of the pumping cycle ? Note that Salter et al was cited as additional evidence of selecting the mode of each chamber on successive cycles of changing working chamber volume, as evidenced in Column 6, Lines 49-55: "It will, for example, be possible to programme the operation of a pump so that its output varies from cycle to cycle. Alternatively, a pump can be divided into a number of independently operable sections each comprising a plurality of cylinders. Each section can be independently controlled as to displacement .."

84. Applicant has argued that given the possibility of partial strokes, one of ordinary skill in the art reading Nippert would allegedly use (only) continuous partial cycles to provide the desired flow rate of fluid.

85. Examiner's Response: Claim 1 does not require that the full mode AND partial mode be used, the claim allows for only partial cycles to be used to provide the desired flow rate of fluid.

86. Applicant has argued that "Digital" does not in any way suggest a continuous "analog" range of output as could be obtained using partial strokes.

87. Examiner' Response: The examiner contends that the applicant is interpreting the word "Digital" too narrowly. Analog to digital converters and digital to analog converters are well known, where a set of discrete digital values represents an analog signal. To one of ordinary skill, a digital PUMP should broadly suggest choosing a combination of a set of discrete volumes to best represent the desired volume to be pumped. Note that applicant is referring to binary (base 2 - 0 or 1) as the only digital values, however digital values can also be octal (base 8 – 0, 1, 2, 3, 4, 5, 6, 7). Figure 2 of Sturman shows 8 cylinders, and an octal value can be assigned to each cylinder.

88. Applicant has argued that fluid allegedly cannot be bypassed during motoring, because, allegedly, if delivered to the low pressure manifold it would exit the working chamber explosively, creating noise and happening at an uncontrollable speed. Allegedly, no strategy for obtaining partial strokes except by bypassing is taught by Nippert, and bypassing is allegedly impossible during partial motoring.

89. Examiner's Response: The fluid of Nippert would not exit the working chamber explosively due to the presence of pressure relief valves (80) even if the alleged explosive condition exists temporarily. Note further that the bypassing proposed by examiner is only ONE strategy for obtaining the partial mode. Nippert clearly discloses the full pumping mode (Column 7, Lines 62-65), a partial pumping mode (Column 8, Lines 43-47) and at least a full motoring mode (Column 9, Lines 46-50). In view of the

full pumping mode, partial pumping mode and full motoring mode, one of ordinary skill would at least try to generate a partial motoring mode, See MPEP 2141, Section III, Rationale (E): "Obvious to try". In view of obviousness rationale E, the examiner contends that based on Nippert ALONE, without relying on any discussion in the above rejections, a partial motoring mode will be apparent to one of ordinary skill in the art.

90. Applicant has argued that Nippert is explicit in describing pumping but allegedly makes no mention of motoring.

91. Examiner's Response: Column 7, Lines 34-36 of Nippert clearly state: "the operation thereof is being described with it being used as a fluid pump 12. However, it is recognized that it IS ALSO APPLICABLE AS A FLUID MOTOR". Therefore it is a matter of common sense to expect a partial motoring mode in view of the described partial pumping mode. Note also that Salter et al discloses in Column 4, Lines 30-31: "a partially disabled motor" which implies a partial motoring mode.

92. Applicant has argued that the Salter et al description is not for a partial motoring mode but allegedly for a failure mode. In this case allegedly, the displacement of fluid is not under control of the controller but the high-pressure valve and the low-pressure valve.

93. Examiner's Response: The word "failure" (mode) does not exist anywhere in the description of Salter et al. Further, all the valves are clearly controlled by the controller as suggested in Column 2, Lines 57-60: " The poppet valves 13 and 15 are active

electromagnetic valves controlled electrically by a microprocessor controller 20 feeding control signals, via optoisolators 21, to valve-driving semiconductors 22".

94. Applicant has argued that the Mestieri is not relevant because it is based on a completely different process than Salter et al

95. Examiner's Response: MPEP 2141.02, Section VI states that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984). The examiner contends that one of the broader teachings of the Mestieri as a whole is that a partial motoring mode can be created simply by manipulation of the controlling valves as suggested in Column 5, Lines 1-5. Therefore, one of ordinary skill will know that it is POSSIBLE to operate the valves of the Salter et al or Nippert apparatus to generate the partial motoring mode.

Conclusion

96. The crux of applicant's invention in Claim 1 appears to be a manner in which the prior art apparatus is operated to generate five modes (full pumping, full motoring, partial pumping, partial motoring and idle), which is not patentable in view of MPEP 2114, title of the third paragraph: "Manner of operating the device does not distinguish

an apparatus claim from prior art". The five modes are known in the art, see Song et al (PG Pub US 20050179185 A1) in Paragraph [0024].

97. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DNYANESH KASTURE whose telephone number is (571)270-3928. The examiner can normally be reached on Mon-Fri, 9:00 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on (571) 272 - 7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devon C Kramer/
Supervisory Patent Examiner, Art Unit 3746

DGK